IV. *A Letter from* Cromwell Mortimer, *M.D. Fellow of the* Royal College *of* Phyſicians London, *Secretary to the* ROYAL SOCIETY *of* London, *Member of the* Gentlemens Society *at* Spalding, *&c. to* William Bogdani, *Eſq;* F.R.S. *and Member of the ſaid Society at* Spalding, *&c. containing a ſhort Account of Dr.* Alexander Stuart's *Paper concerning the* Muſcular Structure *of the* HEART: *Which was read at ſeveral Meetings of the* ROYAL SOCIETY *in* May *and* June 1735. *drawn up at the Requeſt of ſeveral Gentlemen of the* Spalding Society. *Now publiſhed with ſome Additions.*

Dear SIR,

I Was out of Town when your Letter of the 23d paſt came to my Houſe, whereby you inform me, it would be highly agreeable to our Fraternity at *Spalding*, if I would oblige them with a ſhort Account of Dr. *Stuart*'s moſt curious Papers on the Heart, lately laid before the ROYAL SOCIETY: I did not come to Town till ſome Days after, and then I waited for an Opportunity of ſeeing Dr. *Stuart*, and asking his Leave to ſend you an Account of the Papers, as deſired, which I ought not to do without it: Theſe are the Reaſons of my not having wrote ſooner. I deſire you to make my Compliments to

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the Society, and beg their Acceptance of this rough Sketch of the Doctor's moſt curious Diſcoveries, which I have drawn by Memory, not having any of the Doctor's Papers by me, except ſome Drawings, of which I herewith ſend you Copies, [and are engraved, with ſome Improvements, in the Tables annexed; ſee TAB. I. Fig. 1, 2, 3, 4.]

I ſhall not here undertake to give a Deſcription of all the Parts belonging to the Heart, ſuppoſing them already ſufficiently known from the anatomical Writers; but ſhall only explain the ſurpriſing Simplicity of the *Muſcular Structure* of the HEART, as the ingenious Dr. *Stuart* hath demonſtrated it from various Preparations of boiled Hearts; *viz.* that *the Heart is nothing elſe than a ſingle Muſcle of nearly a ſemicircular Form, whoſe Fibres are all parallel:* For, ſuppoſe a rectangular Parallelogram *ABCD*, (ſee TAB. I. Fig. 1.) conſiſting of Two Squares *ABEF*, and *EFCD*; in each of which draw firſt the Diagonals *EB* and *CF*; then fill the whole Parallelogram, or both Squares, with Lines at equal Diſtances, and parallel to the Diagonals: This done, at the Centre *F*, with the *Radius FB*, draw the Semicircle *BED*. [and do the ſame on the Back-ſide of the Paper; ſo that every Line on the Back-ſide may lie exactly under each correſponding Line on the Fore-ſide, and that each Side may be as exactly alike, as if the Paper were tranſparent, and that the Lines might be ſeen equally plain on either Side:] Cut this Semicircle out of the Parallelogram, and cut out likewiſe a ſmall ſemicircular Piece at the Centre *F*; then roll up this ſemicircular Piece of Paper in a conical manner, ſo that the Back-ſide of *D* [or to *I*, in Fig. 2.] be folded to the Back of *E* [or to *H* in Fig. 2.] and this Fold turned round, till *E* comes to the Back-ſide of *B*. as in Fig. 3. and the Seam formed by the Edges *B F* and *E F* may be paſted together, only the inner Fold on the Right Side muſt be puſhed back from the outer circular one, ſo as to form a Partition, as at *G*. in Fig. 4. and 3. by which means Two Cavities will be formed, that on the Right Side the Partition in this Form , the other, on the Left Side, almoſt circular, thus, ○, as in Fig. 4. the Outſide of the firſt conſiſting but of one ſingle Fold, the Outſide of the latter conſiſting of a double Fold, and the Partition being but of one Fold: Thus the firſt Cavity repreſents the Right Ventricle of the Heart, the other the Left Ventricle, and the Partition *G* the *Septum*, as in Fig. 4. [All theſe Particulars are diſtinctly expreſſed in Fig. 2. which is to be cut off from Fig. 1. 3. and 4. and is to be folded upon the Line *B D*, ſo that the Letters *E E* and *H H* come exactly Back to Back, and that the Line *EF* and *H F* tally preciſely; paſte this Paper thus folded together Back to Back, then cut off the white Paper to the Rim of the Circle, and cut out a Piece at the Centre to *F*, and you will by this means have a ſemicircular Piece of Paper, with all the Lines repreſented on both Sides tallying to each other, as above deſcribed at Fig. 1. But as it was very difficult to print on each Side of the ſame Paper, ſo as to make the Lines tally, I thought it better to have this Figure printed in a whole Circle, that ſo ſuch, as would be at the Pains, might cut it off, paſte it, and fold it, and thus, as it were, form a Model of an Heart. In this Figure likewiſe I ordered the Engraver to diſtnguiſh the ſeveral Surfaces of the muſcular Coats, by Lines and Dots, in ſuch manner as Colours are repreſented in Heraldry-graving: Thus the Outſide of the Right Ventricle is ſhaded with Lines running from Top to Bottom pretty cloſe, which denote that you ſhould paint that of a dark Red; the Outſide of the Left Ventricle, with Lines in the ſame Direction, but farther aſunder, to denote a lighter Red; the Inſide of the Right Ventricle is ſhaded with Lines from Right to Left, to denote it ſhould be coloured (for Diſtinction-ſake) blue; then, where the double Courſe of Fibres form the outward Side, or Left Side of the Left Ventricle, and which are not to be ſeparated but by Art, there the Paper is left white or blank; but the Inſide of the Cavity of the Left Ventricle is dotted, to repreſent yellow, that it may be coloured ſo: The colouring the Figure in this manner, makes all the Parts much more diſtinct, when rolled up into a Cone.]

This Model, if I may ſo call it, compared with the Heart of Man or Quadruped, will be found to anſwer in the following Manner: The Edge *B F*, in Fig. 1. or *E F*, in Fig. 2. anſwers to the tendinous Seam or *Sulcus*, which runs along the ſuperiour Side of the Heart; and the Direction of the parallel Lines in Fig. 1. and 2. anſwers to the Courſe of the Fibres in each Part of the Heart; the circular Edge of the Paper *B E D* anſwering to the tendinous Circle round the Baſe of the Heart, from which, and the Seam *B F*, all the muſcular Fibres take their Original: The exterior Fibres of the Right Ventricle, next the *Apex* or Point of the Heart at *F*, decuſſate * each

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* This may be imitated by gumming on Threads, in the ſame Directions as the parallel Lines in *Fig.* 1. turning them back croſs the Hole left at *F*.

other,

other, run inwards, and then, riſing up again towards the Baſe, form that Side of the *Septum* which conſtitutes Part of the Inſide of the Right Ventricle; and likewiſe form the *Columnæ carneæ* of the Right Ventricle: The Fibres of the interiour Courſe of the Left Ventricle decuſſate and form in the ſame manner the internal Fibres and *Columnæ carneæ* of the ſame Ventricle: The external Courſe of Fibres of the Left Ventricle are only a Continuation of thoſe of the Right Ventricle, which together embrace the Heart circularly, while the internal Courſe of Fibres of the Left Ventricle run chiefly from the *Apex* towards the Baſe, ſo that on the Left Side of the Ventricle they croſs the external Courſe nearly at Right Angles; but on the Side of that Ventricle which forms the *Septum*, they run from the *Apex* towards the Baſe, in the ſame Direction as on that Side of the *Septum* which is next to the Right Ventricle.

The ſeveral Courſes of the Fibres may be eaſily traced in a boiled Heart; and if they are not found to anſwer to the Directions of the Lines on the Paper-cone with the ſtricteſt mathematical Exactneſs, when rolled up as at Fig. 3. you muſt conſider, that the Form of the Heart is not exactly conic, though neareſt reducible to that Figure; and moreover that the Baſe is not a Plane as in the Paper-cone, but of a convex round Form; and the tendinous Circle round it is of a ſmaller Diameter than the Middle Part of the Heart.

By this Structure and Circumvolution of the Fibres, the Muſcle which conſtitutes the Heart, doth, by a ſimple Contraction of its Length, by thoſe external Fibres, which encompaſs both Ventricles, contract the Diameter of the Heart, while by the internal

Fibres, that form the *Septum* and Inſide of the Left Ventricle, it ſhortens the Length of the Heart, or draws the *Apex* up nearer to the Baſe: This is done without any Contrariety in the Action of theſe Fibres, or deſtroying the Force of each other; but, on the contrary, they being all parallel to each other, and a Continuation of the ſame Fibres, do aſſiſt each other in their Action.

The Doctor ſuppoſes this Contraction is not cauſed ſo much by the Influx of the nervous Spirits, as by the Influx of the arterial Blood, through the Coronary Arteries into the Subſtance of the Heart; and that the Contraction of the Auricles comes from the ſame Cauſe; which will be alternate with that of the Heart, becauſe the lateral Branches, which ariſe out of the Trunk of the Coronary Artery, that encompaſſes the Baſe of the Heart and both Auricles, are on one Side diſtributed into the Subſtance of the Heart, and on the other Side into the Coat of the Auricles; and will be alternately compreſſed, and alternately free, as the Auricles and Ventricles are alternately full or empty of Blood.

I hope you will excuſe the Imperfections of this ſhort Account; and that our Brethren will accept it as a Mark of my Reſpect, and that it may ſatisfy their Curioſity for the preſent, till the Doctor's Account at large ſhall be publiſhed. I am,

London, Aug. 7.
1735.
To Wm. Bogdani, *Eſq*;
&c. [*then*] *at* Spalding.

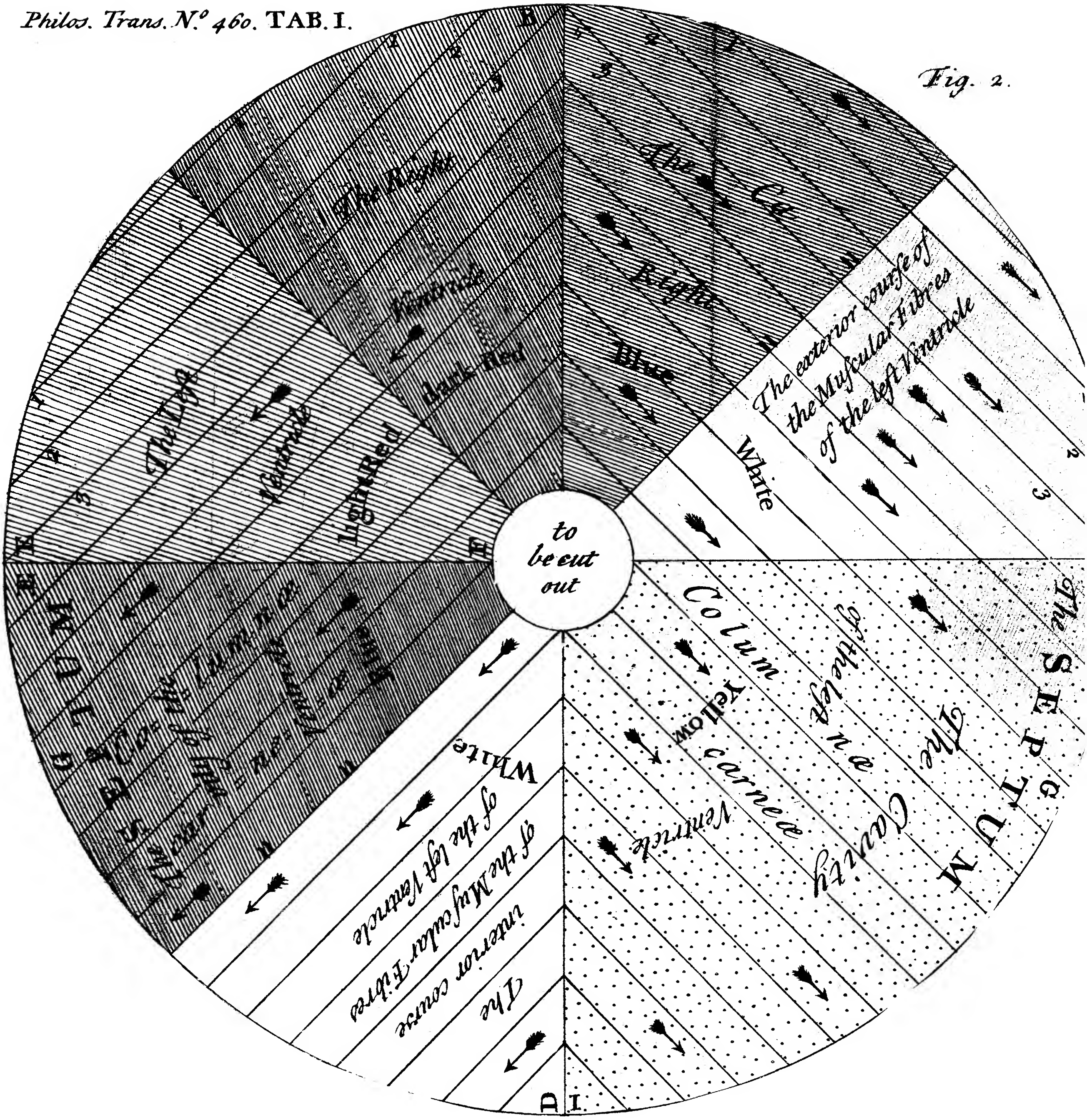
SIR,

Your moſt obliged,
Humble Servant,

C. Mortimer.

Philos. Trans. N.° *460.* **TAB. I.**

Fig. 2.


The Right Ventricle
dark Red
The Left Ventricle
Light Red
The Co Right
Blue
The exterior courſe of the Muſcular Fibres of the left Ventricle
White
to be cut out
Colum carneæ of the left Ventricle
Yellow
The Cavity
The SEPTUM
White
The interior courſe of the Muſcular Fibres of the left Ventricle
SEPTUM
B
E
F
D
I
1
2
3
4

Philos. Trans. N^o 460.

TAB. I.

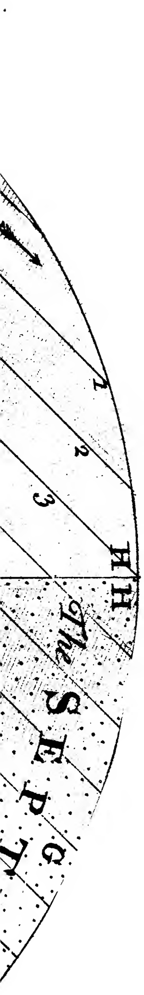


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Fig. 3.

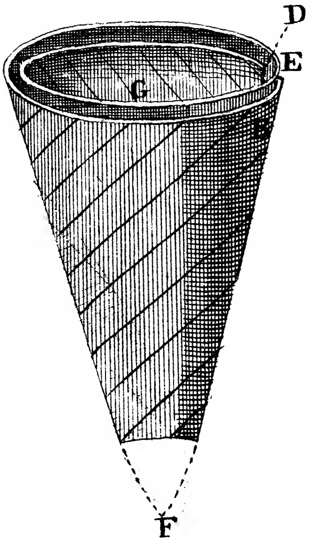
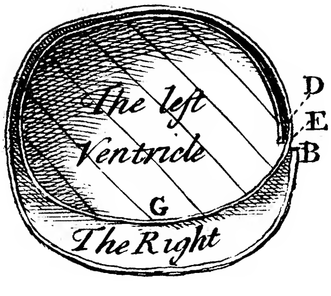
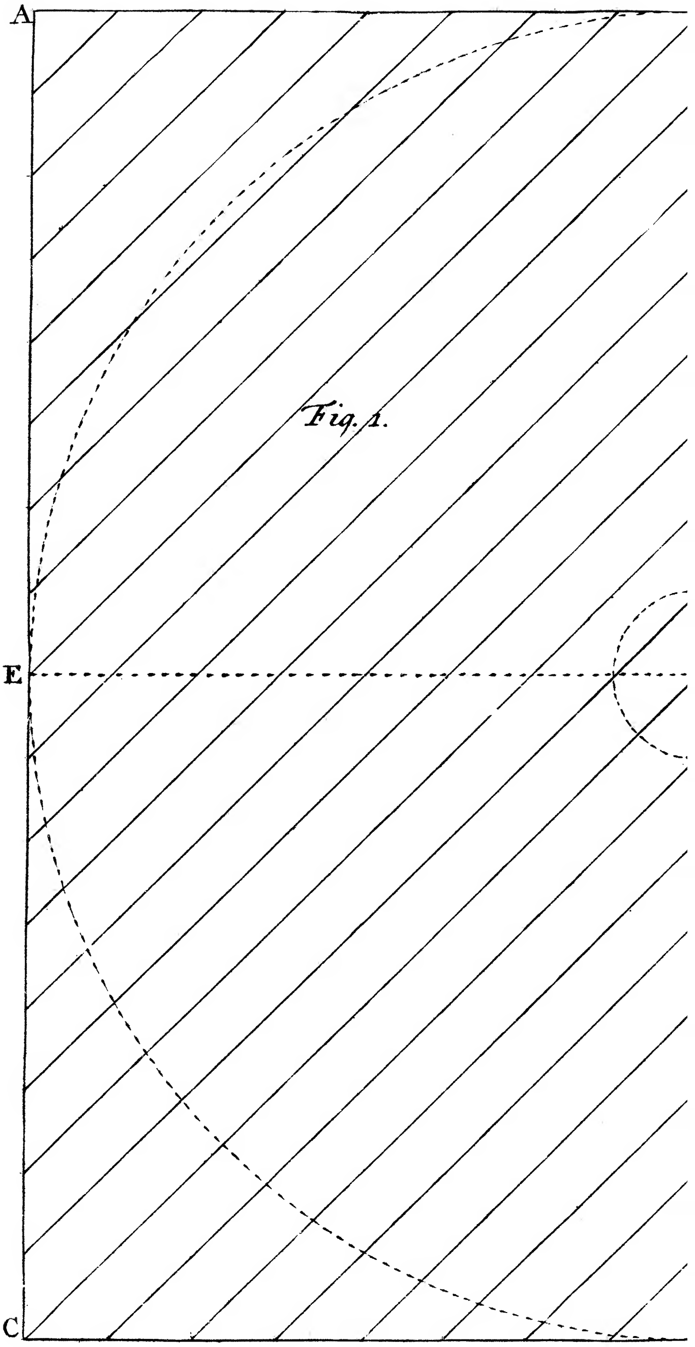
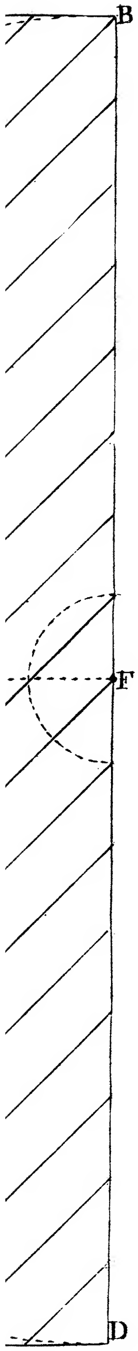


Fig. 4.

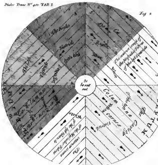





B
F
D

Philos Trans No 420 TAB I

Fig 2



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TAB I

Fig 3

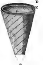
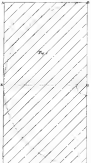


Fig 4

Fig 1



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